Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/135
UNITED KINGDOM
February 1964
Original: ENGLISH

Confidential until official release during Conference

Abstract

HEAT TRANSFER AND PRESSURE DROP PERFORMANCE OF HERRINGBONE AND HELICAL FIN FUEL ELEMENTS FOR URANIUM/MAGNOX REACTORS

by

* C.Cunningham
\+ B.E.Boyce
= T.Davis
Ƶ B.N.Furber

Polyzonal fuel elements designed for gas-cooled Uranium-Magnox reactors in Great Britain have either multistart helical or "herringbone" fins as extended surfaces. This paper deals principally with the experimental determination of the heat transfer and pressure drop characteristics of such elements and is divided into four main parts.

The performance data which is necessary for the selection of a suitable fuel element design is discussed in the first section. Test results are presented to illustrate the effects of changes in the salient element parameters, e.g. number or lead of fins, on heat transfer and pressure drop. These results are compared with predictions using previously published correlations.

When a design of fuel element has been selected for a reactor, its performance is required in great detail and to a high accuracy to enable the reactor designer to calculate station output and fuel element temperatures under normal operating conditions. The second part of the paper describes the refinements in test apparatus and a typical experiment design evolved to measure

* Atomic Power Projects, Whetstone, near Leicester
\+ United Power Company, London
= U.K.A.E.A., Reactor Group, Windscale
Ƶ The Nuclear Power Group, Knutsford

heat transfer for these conditions.

The chosen fuel element must also be designed for safe operation when the reactor is running on part load at low coolant flows or when system faults cause partial or virtually complete loss of coolant. Experiments to provide performance data for element assessment under such conditions are described in the third section together with typical results.

The final section deals with two important aspects of polyzonal fuel element performance on which little or no data has been published. These are (a) the influence of random orientation of successive elements in a reactor channel on heat transfer and pressure drop, and (b) the changes in performance associated with deformation of the finning by gas forces. Experimental results are presented which illustrate the magnitude of effects of these two features on heat transfer and pressure drop.